CLAIMS

We claim:

1. A method for determining a univariate ARIMA model of a time series utilizing a computer comprising:

inputting the time series comprised of separate data values into said computer;

inputting the seasonal cycle for the time series into the computer;

determining whether the time series has any missing data values;

if any data values are missing, imputing at least one of the missing values into the time series;

determining whether the separate data values and any imputed data values of the time series are positive numbers;

if the data values are all positive, determining if logarithmic or square root transformation is needed;

if transformation is needed, transforming the time series comprised of positive separate data values and any positive imputed values;

determining the differencing order for the time series;

determining the non-seasonal AR and MA orders;

constructing an initial ARIMA model for the time series based on the differencing order and the AR and MA orders determined earlier; and

modifying the initial ARIMA model based on iterative model estimation results, diagnostic checking and ACF/PACF of residuals.

2. The method of claim 1 where transforming the time series is comprised of a variance stabilizing transformation.

3. The method of claim 1 wherein transforming the time series is comprised of a level stabilizing transformation.

4. The method of claim 1 wherein transforming the time series is comprised of a variance stabilizing transformation and a level stabilizing transformation.

5. The method of claim 1 wherein determining the non-seasonal AR and MA orders is comprised of utilizing ACF, PACF, and EACF.

6. The method for determining the most optimum univariate model between the optimum exponential smoothing model and the optimum ARIMA model comprising:

calculating an NBIC value for each of the optimum exponential smoothing model and the ARIMA model; and

selecting, as the most optimum univariate model, one of the optimum exponential smoothing model and the ARIMA model; said selected model having the smallest NBIC.

7. The method of claim 6 further comprising calculating a revised NBIC value that makes the exponential smoothing and the univariate ARIMA models comparable by eliminating effects attributable to transformation and differencing.

8. A method for determining the order of a multivariate ARIMA model of a time series utilizing a computer comprising:

inputting the time series into the computer;

inputting the seasonal length for the time series into the computer;

inputting at least one category consisting of predictors, interventions and events represented by numerical values into the computer;

determining the univariate ARIMA order for the time series inputted into the computer;

determining whether the input of the categories has one or more missing values;

discarding the categories having any missing values;

transforming the positive inputted categories using the same transformation applied on the time series inputted;

differencing the inputted category using the same differencing orders applied on the time series inputted;

differencing further some inputted categories if necessary;

constructing an initial ARIMA model for the time series based on the univariate ARIMA found for the time series, the interventions and events, and the remaining predictors; and

modifying the initial ARIMA model based on iterative model estimation results, diagnostic checking and ACF/PACF of residuals.

9. The method of claim 8 where transforming the time series is comprised of a variance stabilizing transformation.

10. The method of claim 8 wherein transforming the time series is comprised of a level stabilizing transformation.

11. The method of claim 8 wherein transforming the time series is comprised of a variance stabilizing transformation and a level stabilizing transformation.

12. The method of claim 8 wherein the step of differencing further the inputted category comprises:

(a) for each said predictor, calculating the cross correlation function (CCF) between the already differenced predictor and the differenced time series inputted; and

(b) finding the further differencing order and differencing further the category where those predictors have CCFs that are insignificant.

13. The method of claim 8 further comprising:

(a) prior to constructing the initial model, eliminating any predictors with insignificant CCF's between the properly differenced predictor and the properly differenced time series inputted; and

(b) after constructing the initial model, eliminating the predictor with all insignificant estimated coefficients wherein said predictor is eliminated one at a time after each model estimation.

14. The method of claim 8 wherein the step of constructing an initial model comprises assigning an initial ARMA model with AR and MA orders found for the time series inputted to disturbance series.

15. The method of claim 8 further comprising changing the transfer function of some predictors into a rational form with a nonempty denominator.

16. A data processing system for determining the order of a univariate ARIMA model of a time series comprising:

a computer processor;

a memory responsively coupled to said computer processor containing:

(a) a set of computer instructions for accepting data input into the memory of the time series comprised of separate data values;

(b) a set of computer instructions for accepting the input of seasonal data into a memory of the time series;

(c) a set of computer instructions for determining whether the time series has any missing data values;

(d) a set of computer instructions for imputing at least one of the missing values into the time series;

(e) a set of computer instructions for determining whether the separate data values and any imputed data values of the time series are positive numbers;

(f) a set of computer instructions for transforming the time series comprised of positive separate data values and any positive imputed values;

(g) a set of computer instructions for determining the differencing order for the time series;

(h) a set of computer instructions for constructing an initial ARIMA model for the time series based on the differencing order and the AR and MA orders determined earlier; and

(i) a set of computer instructions for modifying the initial ARIMA model based on iterative model estimation results, diagnostic checking and ACF/PACF of residuals.

17. The data processing system of claim 16 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation.

18. The data processing system of claim 16 wherein the set of computer instructions for transforming the time series includes instructions for performing a level stabilizing transformation.

19. The data processing system of claim 16 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation and a level stabilizing transformation.

20. A non-volatile storage medium containing computer software encoded in machine readable format for determining the order of a univariate ARIMA model of a time series comprising:

(a) a set of computer instructions for accepting data input into the memory of the time series comprised of separate data values;

(b) a set of computer instructions for accepting the input of seasonal data into a memory of the time series;

(c) a set of computer instructions for determining whether the time series has any missing data values;

(d) a set of computer instructions for imputing at least one of the missing values into the time series;

(e) a set of computer instructions for determining whether the separate data values and any imputed data values of the time series are positive numbers;

(f) a set of computer instructions for transforming the time series comprised of positive separate data values and any positive imputed values;

(g) a set of computer instructions for determining the differencing order for the time series;

(h) a set of computer instructions for constructing an initial ARIMA model for the time series based on the differencing order and the AR and MA orders determined earlier; and

(i) a set of computer instructions for modifying the initial ARIMA model based on iterative model estimation results, diagnostic checking and ACF/PACF of residuals.

21. The non-volatile storage medium of claim 20 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation.

22. The non-volatile storage medium of claim 20 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a level stabilizing transformation.

23. The non-volatile storage medium of claim 20 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation and a level stabilizing transformation.

24. A data processing system for determining the order of a multivariate ARIMA model of a time series comprising:

a computer processor;

a memory responsively coupled to said computer processor containing:

(a) a set of computer instructions for accepting data input into the memory of the time series comprised of separate data values;

(b) a set of computer instructions for accepting the input of seasonal data for the time series;

(c) a set of computer instructions for accepting at least one category consisting of predictors, interventions and events represented by numerical values;

(d) a set of computer instructions for determining a univariate ARIMA model for the time series inputted into the computer;

(e) a set of computer instructions for determining whether the input of the categories has one or more missing values;

(f) a set of computer instructions for discarding the categories having any missing values;

(g) a set of computer instructions for transforming the inputted categories;

(h) a set of computer instructions for determining the differencing order for at least one of the inputted categories;

(i) a set of computer instructions for constructing an initial multivariate ARIMA model for the time series based on the differencing order and the AR and MA orders determined earlier; and

(j) a set of computer instructions for modifying the initial multivariate ARIMA model based on iterative model estimation results, diagnostic checking and ACF/PACF of residuals.

25. The data processing system of claim 24 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation.

26. The data processing system of claim 24 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a level stabilizing transformation.

27. The data processing system of claim 24 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation and a level stabilizing transformation.

28. A non-volatile storage medium containing computer software encoded in machine readable format for determining the order of a multivariate ARIMA model of a time series utilizing a computer comprising:

(a) a set of computer instructions for accepting data input into the memory of the time series comprised of separate data values;

(b) a set of computer instructions for accepting the input of seasonal data for the time series;

(c) a set of computer instructions for accepting at least one category consisting of predictors, interventions and events represented by numerical values;

(d) a set of computer instructions for determining a univariate ARIMA model for the time series inputted into the computer;

(e) a set of computer instructions for determining whether the input of the categories has one or more missing values;

(f) a set of computer instructions for discarding the categories having any missing values;

(g) a set of computer instructions for transforming the inputted categories;

(h) a set of computer instructions for determining the differencing order for at least one of the inputted categories;

(i) a set of computer instructions for constructing an initial multivariate ARIMA model for the time series based on the differencing order and the AR and MA orders determined earlier; and

(j) a set of computer instructions for modifying the initial multivariate ARIMA model based on iterative model estimation results, diagnostic checking and ACF/PACF of residuals.

29. The non-volatile storage medium of claim 28 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation.

30. The non-volatile storage medium of claim 28 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a level stabilizing transformation.

31. The non-volatile storage medium of claim 28 wherein the set of computer instructions for transforming the time series includes computer instructions for performing a variance stabilizing transformation and a level stabilizing transformation.